#12 / SUB. SPEC. (NE)

Our Reference: VMF-491-A PATENT

SECOND SUBSTITUTE SPECIFICATION

ELECTRIC MOTOR UNIT, IN PARTICULAR FOR MOTOR VEHICLE, INCORPORATING CONTROL ELECTRONICS

BACKGROUND

[0001] This invention relates to an electric motor unit and an electronic control of the motor.

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[0002] The electric motor unit proposed by the invention can be advantageously used in a motorized fan used for the heater and/or vent and/or air conditioner of a motor vehicle.

[0003] Historically, the stator of such a motor unit comprises a carbon holder plate (PPC) which includes a brass insert and a radiator.

[0004] The brass insert serves to guide the carbon holders and to bring the current closer to the foot of the MOSFET of the power circuit near the radiator.

[0005] The radiator, generally made of aluminum, provides cooling to the power components (diodes, MOSFET transistors) and provides a space into which several electronic components held on a circuit board that has been imprinted with the control electronics are received and held.

[0006] A motor unit of this type was described in the French patent application that the Applicant filed under number 98 03128.

[0007] One aspect of the invention is that a motor unit structure provides for very high mounting tolerances between the radiator and the brass insert.

[0008] In another aspect of the invention, the rigidity and the watertightness of a motor unit structure has been improved.

[0009] It is a further aspect of the invention to provide a motor unit structure of which the means for connecting and the assembly of the components are simplified.

SUMMARY OF THE INVENTION

[0010] The present invention provides an electric motor unit of a motor vehicle having a brush carrier plate that includes a brass insert and a radiator, characterized by the plate having a plastic over-molding that surrounds the insert and the radiator. This over-molding provides make up for play between the parts.

[0011] Furthermore, the over-molding contributes to the rigidity of the plate, which allows optimization of the design of the radiator and the quantity of aluminum used for it, by removing from the radiator the parts that are not necessary for cooling and that only serve to increase the rigidity of the plate. Moreover, the over-molding also includes a partition that separates, in a watertight way, on the plate, the area designed to receive the electronic card and an area carrying the brushes.

[0012] The area that is delimited by the over-molding and which receives the card can furthermore be closed by a lid for which the edge of the over-molding defines a watertight plane.

[0013] The system of the over-molding and the lid defines the imprinted circuit card and the electronic components (in the cold area of the motor) a watertight housing in which the components are thermically isolated with respect to the area that carries the brushes (electrotechnical area – hot area). There is also an decoupling between the electronic area and the electrotechnical area.

[0014] The separation partition can advantageously provide means for respiration allowing circulation of air from one area to another without allowing moisture into the electronic area.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Other characteristics and advantages of the invention will become more clear in the following description. This description is only illustrative and non limiting. It should be read in the light of the attached drawings in which:

[0016] Figure 1 is a cross-sectional schematic view of the motor unit according to one possible embodiment of the invention;

[0017] Figure 2 is an exploded perspective view of a motor unit of Figure 1;

[0018] Figure 3 is a perspective schematic view showing the mounting of the plate to the housing of the motor unit of Figures 1 and 2; and

Figure 4 is a detailed perspective view of the mechanical means for blocking the plate with regard to the housing.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0019] The motor unit which is shown in Figures 1 and 2 includes a housing 1, a rotational axis 2, a stator 3 fixed to the housing, and a rotor 4 powered by the brushes or carbons 5. These brushes 5 are guided by a brass insert 6 which has an electronic brush carrier plate (PPCE) that also includes a radiator 7.

[0020] On this radiator 7 are placed power components 8 (diodes, MOSFET transistors). A printed circuit card C I, which holds control components, is also placed to the right of this radiator 7.

[0021] The PPCE plate also includes an over-molding 9 which surrounds the brass insert 6 and the radiator 7. This over-molding 9 has a partition 10 that separates, in a watertight manner, on the plate, the area that is designed to receive an electronic card C I, from the electrotechnical area that holds the brushes 5. The peripheral over-molding 9 and this partition 10 define, with a lid 12, a watertight housing into which is received the electronics card C I.

[0022] The peripheral over-molding 9 and the transversal partition 10 together define a watertight plane on which is received a gasket 13 that is designed to be compressed between the lid 12 and the edge of the over-molding 9. The lid 12 includes a plastic hood 12a formed from a plastic material into which a metallic-plated hood 12b is placed.

[0023] The printed circuit card C I is double-sided, having components extending from one side of the card to the other.

[0024] Recesses are provided on the overmoulding for positioning and holding the components before soldering the components onto the card.

[0025] The power and control current is led to the electronic components (control components of the printed circuit card and power components (MOSFET,

diodes) mounted on the radiator 7) by the path that is formed by the brass insert 6. The brass insert 6 is directly soldered to the printed circuit card or to the power components. Accordingly, one connecting step between the printed circuit card C I and the brass insert 6 is removed. The connections between the brass insert 6 and the card C I are thus optimized, which provides a considerable reduction of heating of the surface of the electronic card.

[0026] The power components like the MOSFET transistors and the diodes are cooled by the aluminum radiator 7, which is fitted with wings placed in the external air flux.

[0027] The radiator 7, the plastic over-molding 9, and the lid are assembled in such a way to form a watertight housing 1 to the exterior, but also from the interior of the motor (thermal protection, protection from dust, protection from electromagnetic rays, etc.)

[0028] The means allowing the removal of condensation produced by the radiator 7 in the housing 1 defined by the over-molding 9 and the lid 12 are advantageously provided in the watertight partition 10. Also, the over-molding 9 provides means for the passage of the wires designed to power the brass insert (section17). Particularly, the over-molding 9 comprises means allowing the implantation of a connecting module designed to power the insert 6 and the electronic controls and allows the connection towards the exterior by a connector having a complimentary form.

[0029] The electrotechnical part is closed by an end plate F.

[0030] As seen in Figures 2 to 4, the over-molding 9 of the plate includes elastic attachment flaps 14 designed to work together with complimentary forms 15 which are embossed on the housing 1, for keeping the plate secured to the housing 1.

[0031] It is noted that one solution for attachment is particularly economical; typically, the means for mounting the plate to the housing 1 are made up of rolled-stapled sheet metal.

[0032] The elastic flaps 14 and the complimentary forms 15 that are shown the housing 1 can be coupled in such a way to create a single possible relative position

between the plate and the housing 1. For example, the flaps 14 and the forms 15 are angularly spaced, respectively, two by two at 115°, 115°, 130°.

[0033] As is shown in Figure 4, the elastic flaps 14 end, can include chamfered protuberances 16 that facilitate the connection of the plate onto the housing 1 and assure, during mounting, the mechanical stability of the ensemble by avoiding the turning over the plate by the counterweight of the electronics that are incorporated into the motor.